Composition of Functions Video Lecture

Section 12.1

Course Learning Objective:

Demonstrate appropriate manipulation of function notation.

Weekly Learning Objectives:

1) **Construct composite functions.**
2) **Verify that two functions are inverses of each other.**

Composition of Functions

Composition is one way to combine two or more functions by using one function as the input to another function.

Notation:

$(f \circ g)(x) = f(g(x))$

Composition

Let $f(x) = x^2$ and $g(x) = x+1$.

a) $(f \circ g)(2) =$

b) $(g \circ f)(3) =$

c) $(f \circ g)(x) =$

d) $(g \circ f)(x) =$

Let $f(x) = 3x + 2$ and $g(x) = |x|$.

a) $(f \circ g)(3) =$

b) $(g \circ f)(3) =$

c) $(f \circ g)(x) =$

d) $(g \circ f)(x) =$

Let $f(x) = x^2$ and $g(x) = \sqrt{x}$.

a) $(f \circ g)(-1) =$

b) $(g \circ f)(-1) =$

c) $(f \circ g)(x) =$

d) $(g \circ f)(x) =$

In general, $(f \circ g)(x) \neq (g \circ f)(x)$.

If f(g(x)) = x for every x in the domain of g, and
g(f(x)) = x for every x in the domain of f
then f(x) and g(x) are <u>inverses</u> of each other.

Notation: The inverse of f(x) is written $f^{-1}(x)$ **and,**

$$f(f^{-1}(x)) = x \quad \text{and} \quad f^{-1}(f(x)) = x \quad \text{for all } x.$$

Verify that f(x) = 3x + 2 and g(x) = $\frac{x-2}{3}$ **are inverses of each other.**